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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. |
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09/388,031 09/01/99 AKRAM

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MMC1/0329

EXAMINER

LEE, E

| ART UNIT | PAPER NUMBER |
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2815

DATE MAILED:

03/29/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/388,031

Applicant(s)

AKRAM, SALMAN

Examiner

Eugene Lee

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 September 1999.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

- 15) ☒ Notice of References Cited (PTO-892)
- 16) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 18) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Group I (claims 1-28) in Paper No. 8 is acknowledged.
2. Claims 29-99 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 8.

Claim Objections

3. Claim 11 is objected to because of the following informalities: there is a typographical error (claim 11 is dependent on itself) in said claim. Appropriate correction is required.
4. Claim 16 is objected to because of the following informalities: there is a typographical error (i.e. "on the at least"). Appropriate correction is required.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

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6. Claims 1 thru 7, 10 thru 12 and 15 are rejected under 35 U.S.C. 102(e) as being anticipated by Andricacos et al. '609. Andricacos discloses (see, for example, FIG. 5) a metallization structure comprising a substrate 12, dielectric (dielectric layer) 1, metal layer 3, conductive material 15, and conductive sidewall material (metal spacers) 6.

- a. Regarding the metals used for the metal layer and conductive sidewall material, see column 7, lines 1-11.
- b. Regarding claim 3, see column 6, lines 48-60.
- c. Regarding claim 5, see, for example, FIG. 2.
- d. Regarding claim 12, see element 7 of FIG. 5 and column 4, lines 38-41.

7. Claims 16 thru 19, 24, 26 thru 28 are rejected under 35 U.S.C. 102(b) as being anticipated by Saenger et al. '647. Saenger discloses (see, for example, FIG. 5G) a metallization structure comprising a substrate 2, electrically conductive diffusion barrier (first metal layer) 8, conductive plug (second metal layer) 6, dielectric layer 14, opening (aperture) 26, conductive spacer (metal spacer) 28, and fill layer (conductive layer) 34.

- a. Regarding claims 17 and 18, see, for example, column 4, lines 5-12.
- b. Regarding claims 19, see, for example, column 4, lines 49-56.
- c. Regarding claim 26 thru 28, see, for example, column 6, lines 5-9.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

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having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Andricacos et al. '609. Andricacos does not disclose the conductive material selected from aluminum, copper and aluminum-copper alloy. However, it was well known in the art that these materials are conductive and used extensively in the art to form conductive layers. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to use aluminum, copper or aluminum-copper alloy as the conductive material since these materials are conventionally used in the art as conductive layers.
10. Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Andricacos et al. '609 as applied to claims 1 thru 7, 10 thru 12 and 15 above, and further in view of Matsuno '502. Andricacos does not disclose a fluorine-doped silicon oxide. However, Matsuno teaches that dielectric films doped with fluorine provide films with low dielectric constants. See, for example, see column 1, lines 20-63. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to add fluorine to the insulating layer of Andricacos in order to form a low dielectric film, which will improve the overall speed of a semiconductor device (as taught by Matsuno).
11. Claims 20 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saenger et al. '647 as applied to claims 16 thru 19, 24, and 26 thru 28 above, and further in view of Andricacos et al. '609. Saenger does not disclose the metal spacer material as titanium or titanium nitride. However, it was well known in the art at the time of invention that a variety of conductive metals can be used for a metal spacer (see, for example, column 7, lines 1-11 of Andricacos). Therefore, it would have been obvious to one of ordinary skill in the art at the time

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of invention to choose titanium for the metal spacer material since titanium, among a variety of other conductive metals, was regularly used in metal spacers, as shown by Andricacos.

12. Claims 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saenger et al. '647 as applied to claims 16 thru 19, 24, and 26 thru 28 above, and further in view of Fiordalice et al. '523. Saenger does not disclose a dielectric layer underlying the metal layer. However, it was also well in the art at the time of invention to include a dielectric layer on top of a substrate and underneath a metal layer in order to protect the upper surface of a substrate. See, for example, FIG. 7 of Fiordalice where a semiconductor device 20 comprising a dielectric layer 24 underlies a conductive member 26, and covers and protects the surface of substrate 22. It would have been obvious to one of ordinary skill in the art at the time of invention to include a dielectric layer on top of the substrate and underneath the metal layer so that the substrate is covered and insulated, as shown by Fiordalice.

a. Regarding claim 22, see, for example, column 3, lines 31-51 of Fiordalice.

13. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saenger et al. '647. Saenger does not disclose the second metal layer comprising TiN, TiW, WN, or TaN. However, it was well known in the art that these materials are suitably conductive and used extensively in the art to form conductive layers. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to use one of the above materials since they are conventionally used in the art for their conductive properties.


INFORMATION ON HOW TO CONTACT THE USPTO

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eugene Lee whose telephone number is 703-305-5695. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on 703-308-1690. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Eugene Lee
March 23, 2001



EDDIE LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800